C.H. ROBINSON

Freight Performance & Carrier Strategy

Caroline Bleggi

Frederick Zhou

Overview

1. Problem
2. Data
3. Metrics
4. Initial Findings
5. Carrier Clustering Findings
6. Shipper Profiles
7. Implications

1. Problem

Determine groupings of attributes that influence carrier strategy and shipper profile performance.

Why is this important?

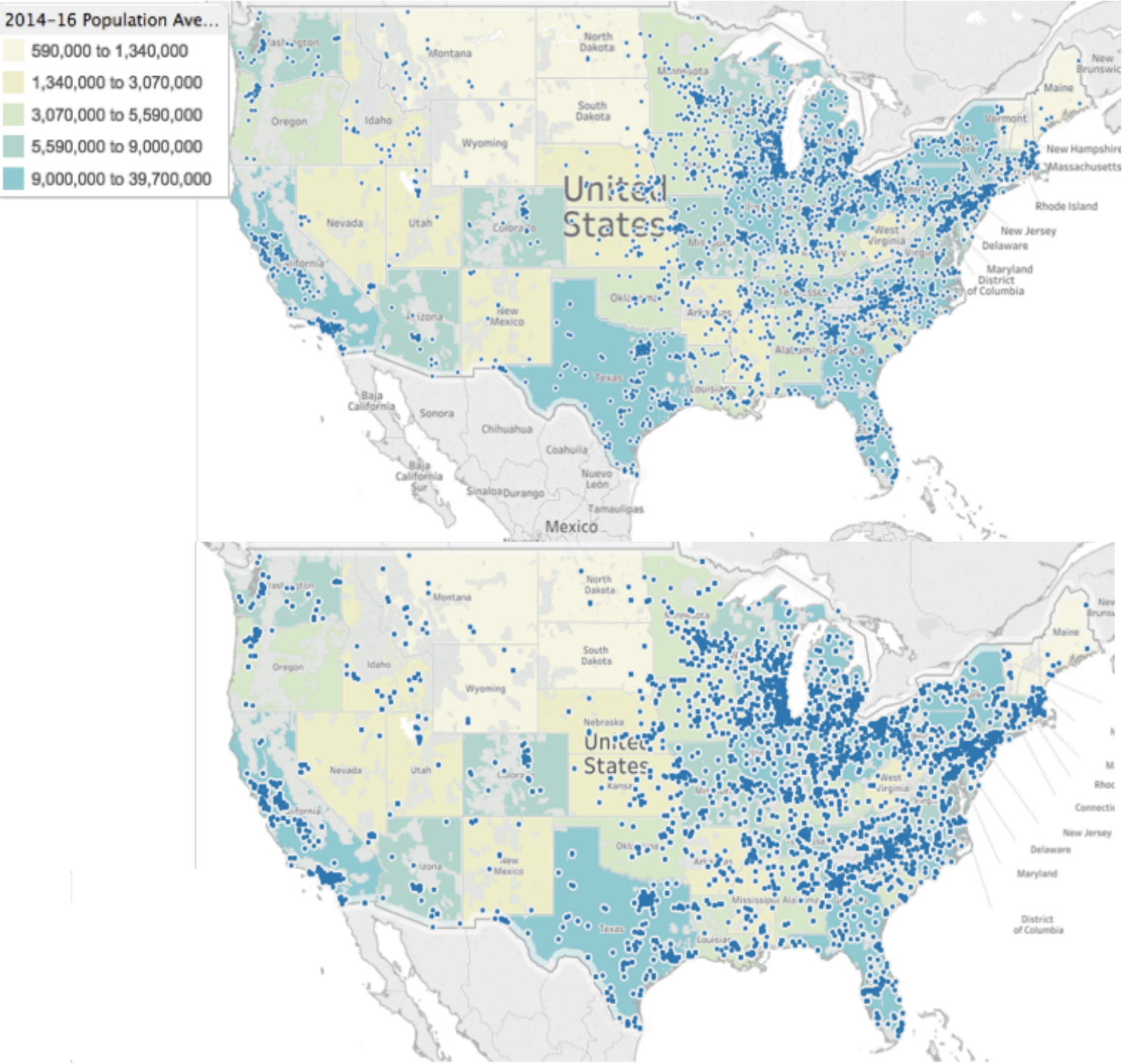
Transportation efficiency is increasingly becoming a critical component of business strategy for shippers.

Shippers and carriers in the freight industry are seeking to improve their efficiency and profitability in this competitive market.

2. Data

Analysis was completed on dataset spanning January 2014 – December 2016 including Tender Level and Stop Level data from our sponsor company

TMC A DIVISION OF C.H. ROBINSON



Origins and Destinations

3. Metrics

- On Time Delivery (OTD)
- On Time Pick Up (OTP)
- 1st Tender Acceptance Rate (AR)
- Perfect Shipment

Metrics over Time

Measure	2014	2015	2016	Overall
OTD	84%	88%	87%	87%
Price/Mile	$2.47	$2.28	$2.10	$2.19
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1st Tender AR	71%	76%	85%	80%

4. Initial Findings

Binary Logistic Regressions

OTD, OTP, 1st Tender Acceptance, Perfect Shipment

High Performing Profile Regression Comparison

	1st Tender Acceptance	OTD	OTP	Perfect Shipment
Carrier Type	Asset Carrier	Not Significant	Asset Carrier	Asset Carrier
Tendered On	Weekday	Not Significant	Weekday	Weekday
Shipper Industry	Manufacturing	Paper & Packaging	Manufacturing	Manufacturing
Bid Type	Non-Spot	Spot	Spot	Non-Spot
Length of Haul	>706 miles	>723 miles	Not Significant	>716 miles
Tender Lead Time	>1.3 days	Not Significant	Not Significant	>2.4 days
Price Age	<152 days	<151 days	<152 days	<148 days

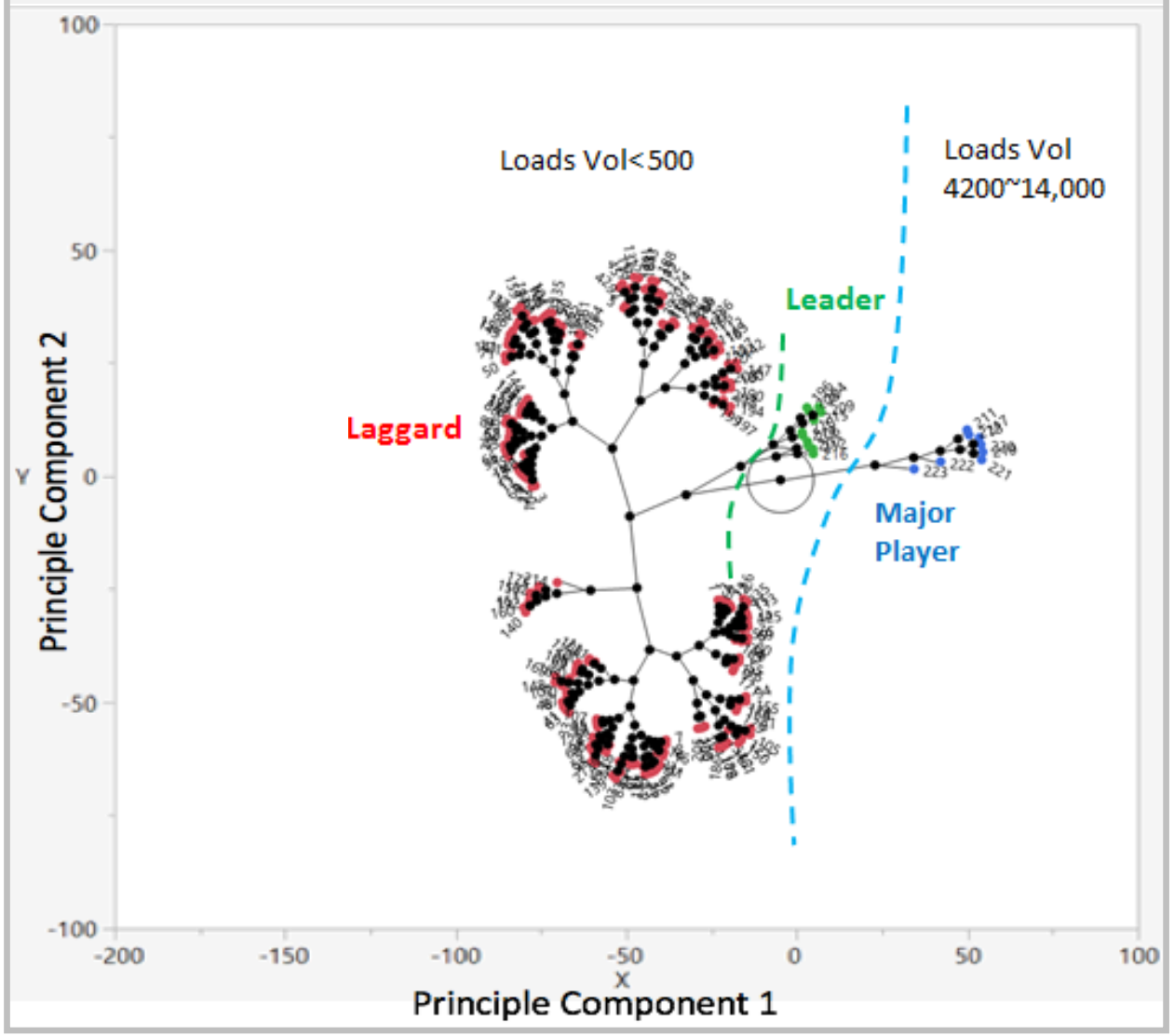
5. Carrier Clustering Findings

Hierarchical clustering for carriers based on:

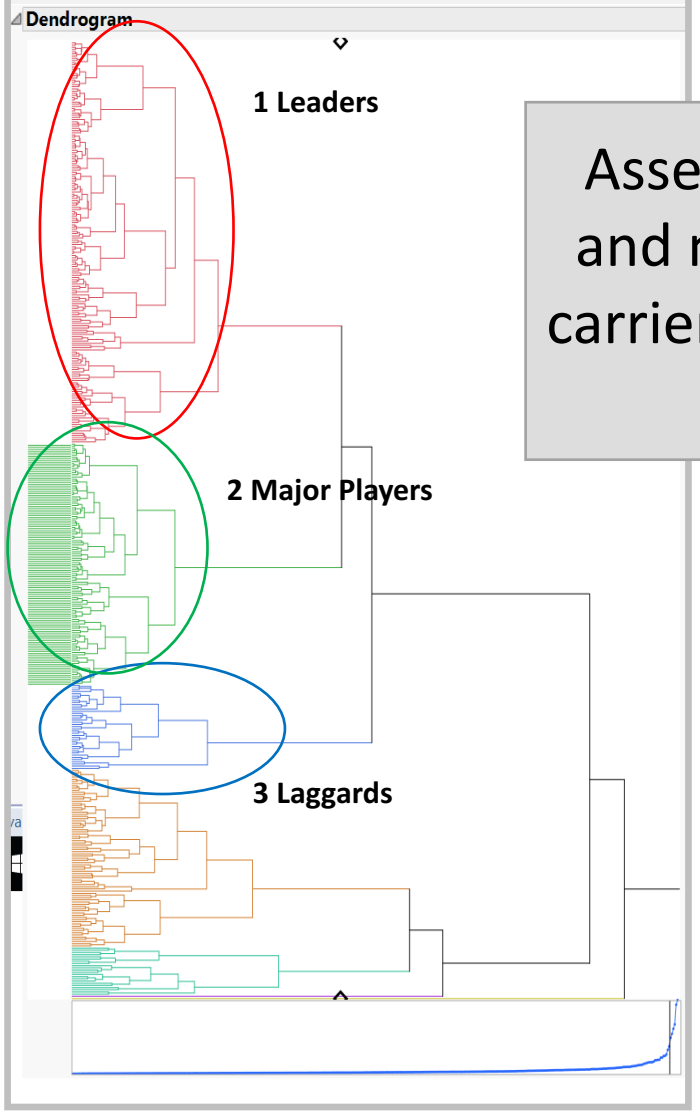
- Fleet Size (how many trucks)
- Geographic Coverage (number of states covered)
- Number of Lanes served
- Number of Customers served
- Industry Coverage
- Lane Focus (number of loads per lane)
- Customer Focus (load density per customer)
- Total Number of Loads

Clustering for Carrier Profiles

Constellation Chart



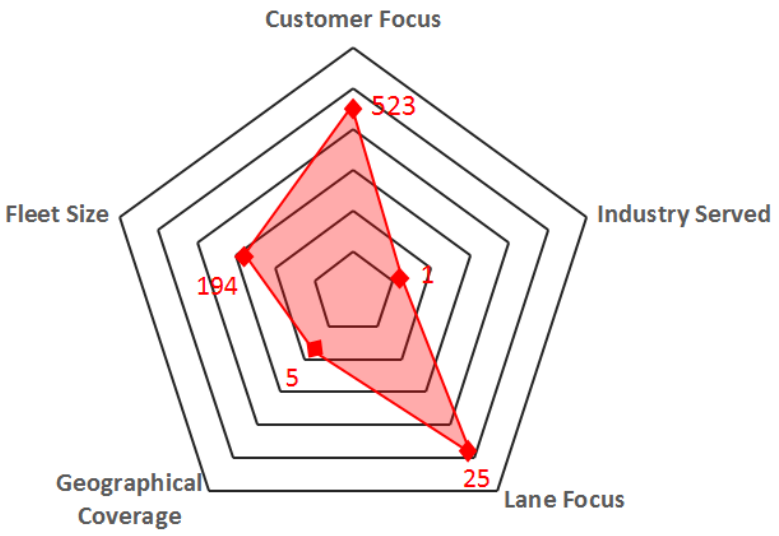
Dendrogram



Asset based carriers and non-asset based carriers were clustered separately

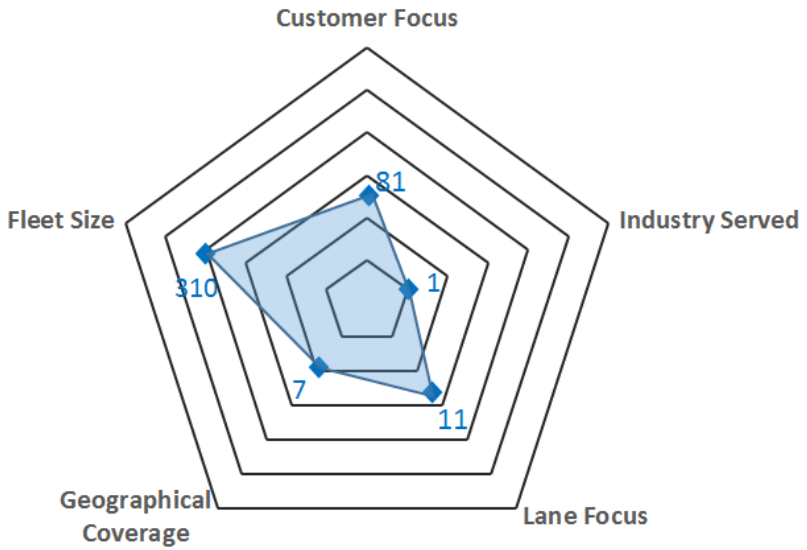
Clustering for Carrier Profiles – Profiling for asset based carriers

Best Performer (110) - Leader
Perfect Shipment Rate **76%**



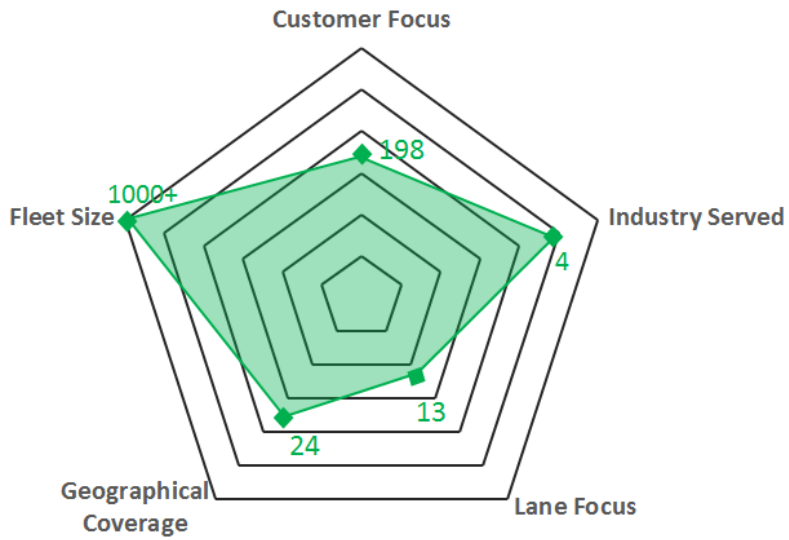
- Mid-sized Carriers
- Focus on limited number of customers within a single industry
- Focus on certain lanes and geographical regions as niche markets

Low Performer (182) - Laggard
Perfect Shipment Rate **31%**



- Mid-sized Carriers
- Serve relatively large number of customers
- Low lane and customer focus

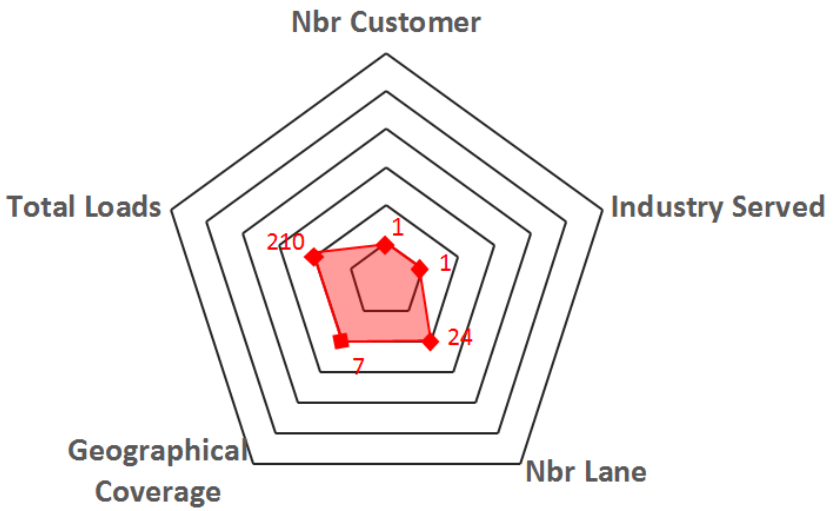
Mediocre (103) – Major Player
Perfect Shipment Rate **56.3%**



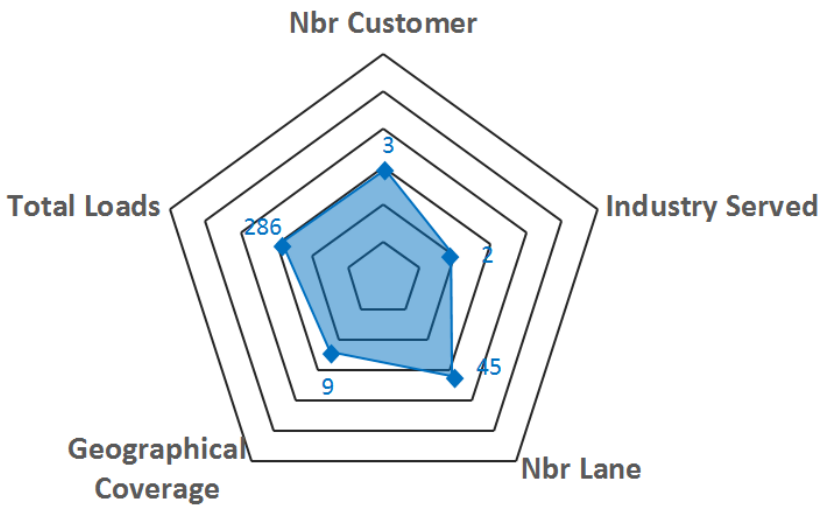
- Large Carriers (1000+)
- Wide geographical service coverage
- Serve many customers across different industries.

Clustering for Carrier Profiles – Profiling for non-asset based carriers

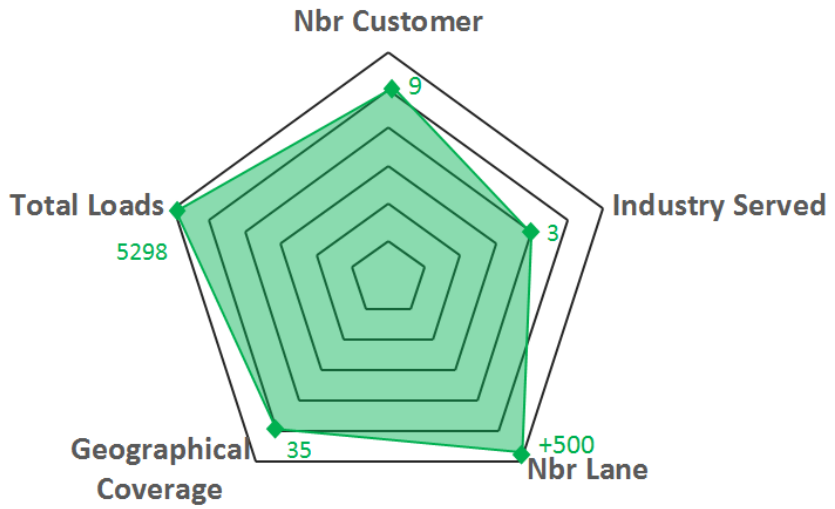
Best Performer (110) - Leader
Perfect shipment rate **86%**



Low Performer (182) - Laggard
Perfect shipment rate **43%**



Mediocre (103) – Major Players
Perfect shipment rate **66 %**



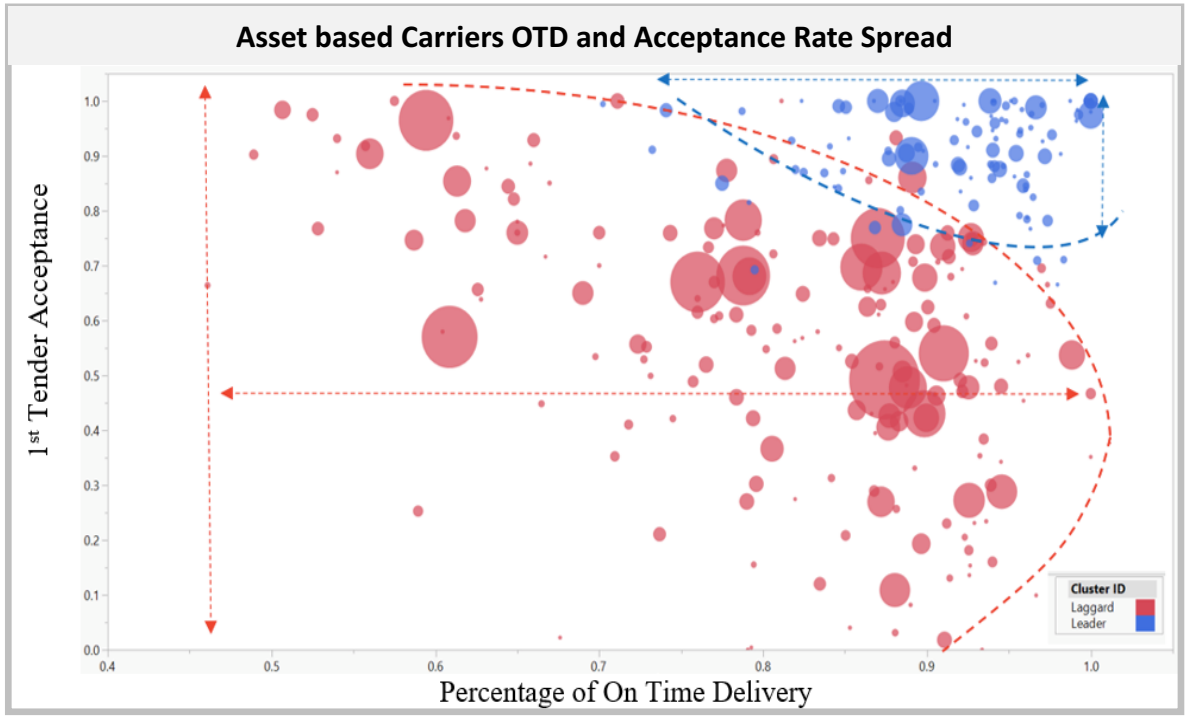
Notice:

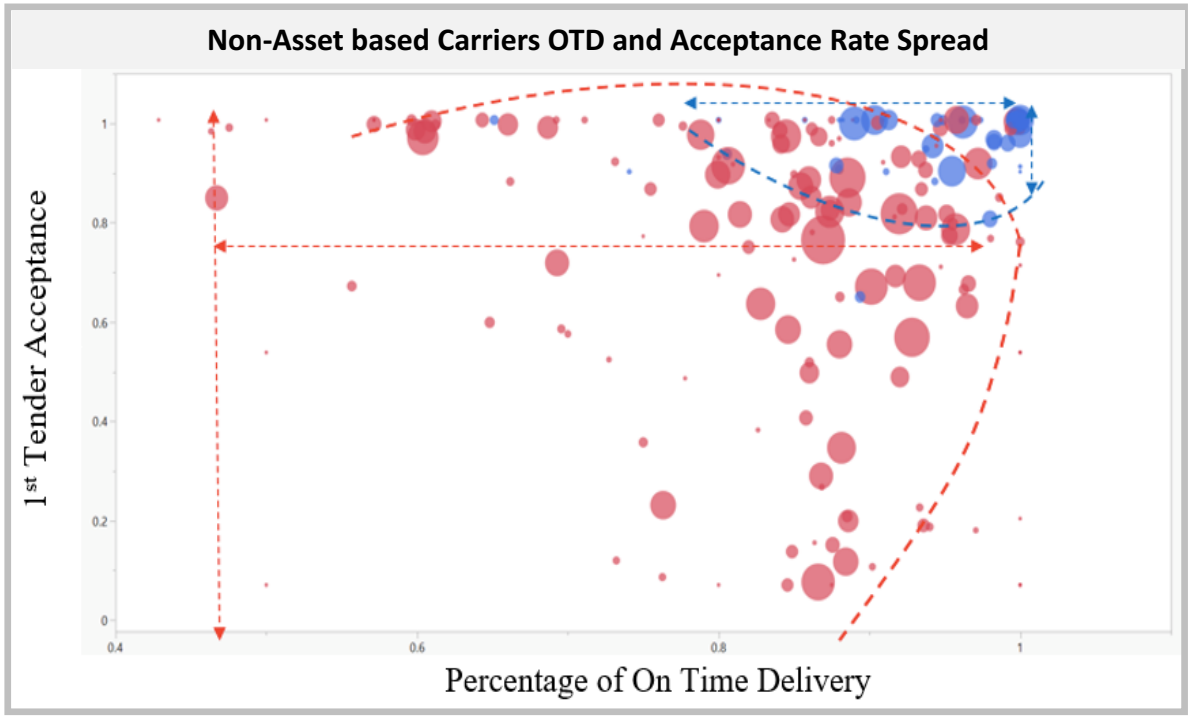
- ❑ Lane coverage smaller for non-asset carrier base than for asset based carrier base
- ❑ To maximize clustering effects, number of customers and number of lanes served replaced customer and lane focus

Non Asset Carrier Characteristics:

- ❑ Leading carriers also show focus in terms of customers and lanes
- ❑ Loads per carriers for non-asset leaders is much smaller than for the asset based carrier leaders, this could reflect capacity limit or more focused strategy
- ❑ The major player cluster takes 80% of the total loads of non-asset category, reflecting a more concentrated capacity

Clustering for Carrier Profiles – Consistency of Performance



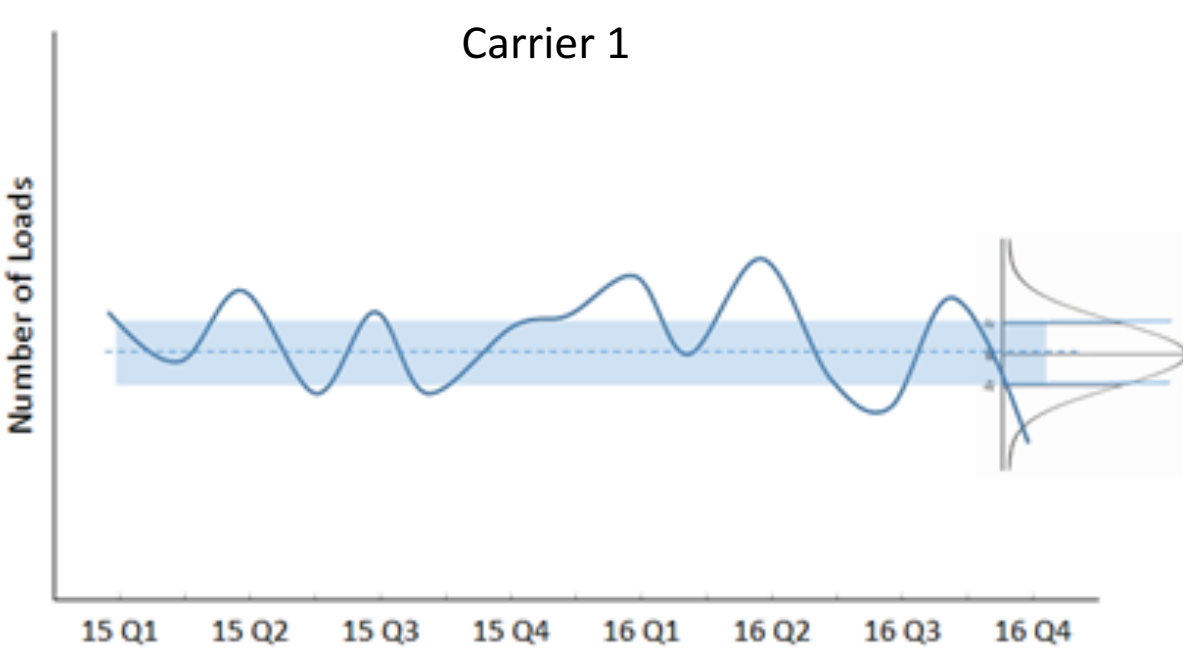


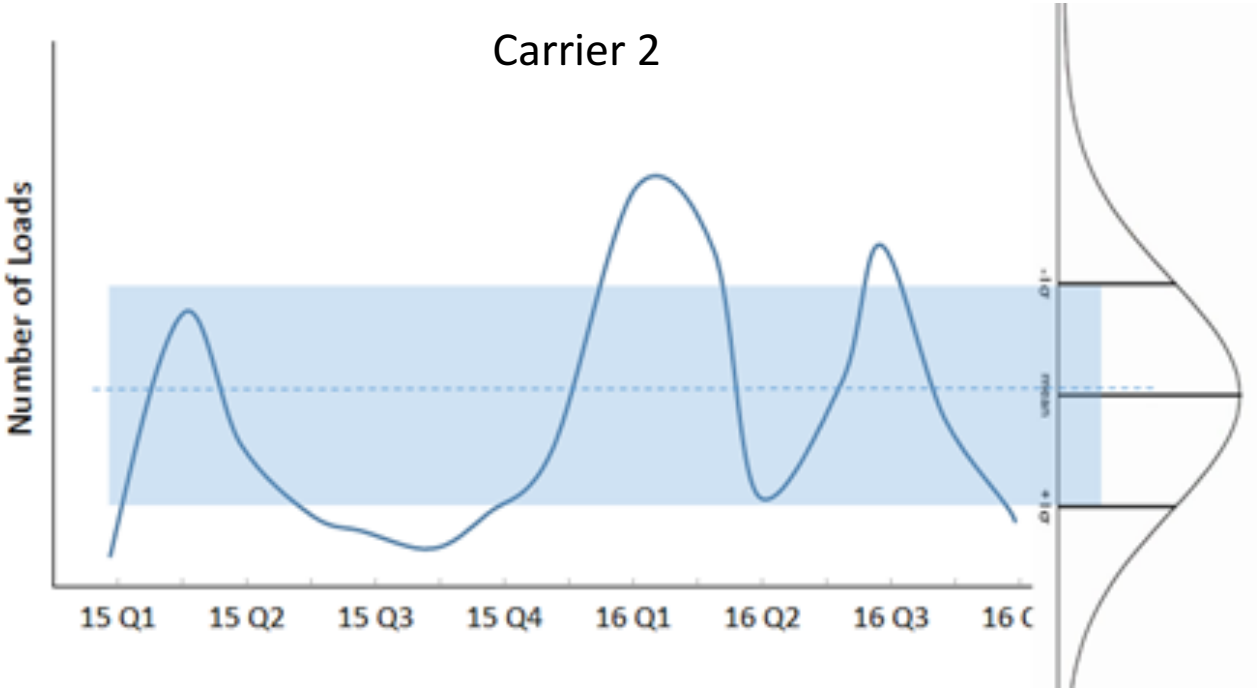
Both asset and non-asset based carriers show the same pattern:

- **Leader** group is more consistent than **Laggard** group in terms of standard deviation of performance on both OTD and 1st Order Acceptance
- The spread of **Laggard** group of OTD and AR is wide and polarized i.e. good OTD but poor AR and vice versa

Clustering for Carrier Profiles

1st Hypothesis: A carrier will perform better if it has more consistent loads

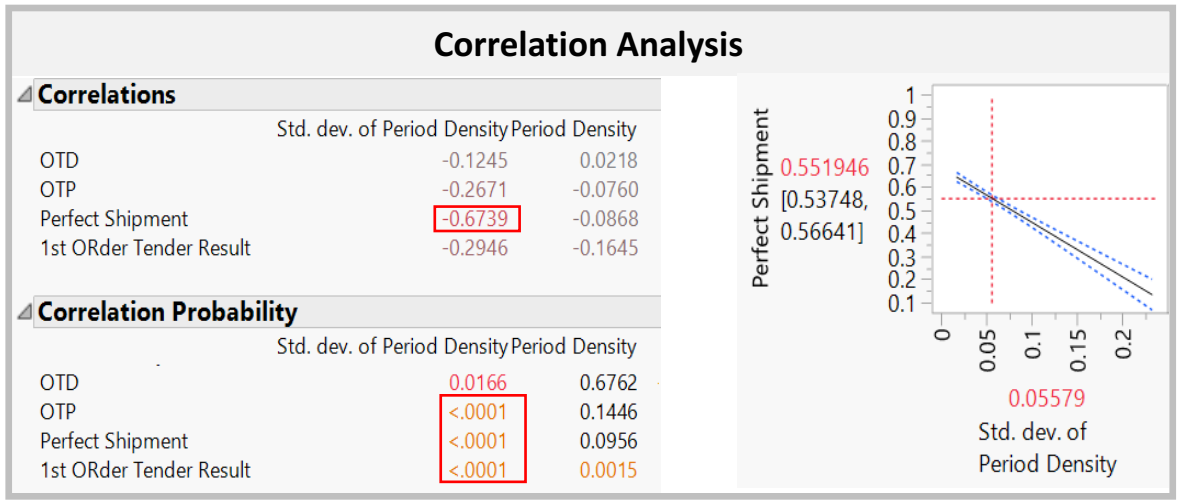




According to the hypothesis, Carrier 1 should have better performance than Carrier 2

Period Density: Loads per as % of total loads in a 2 year time frame for a carrier.

Clustering for Carrier Profiles

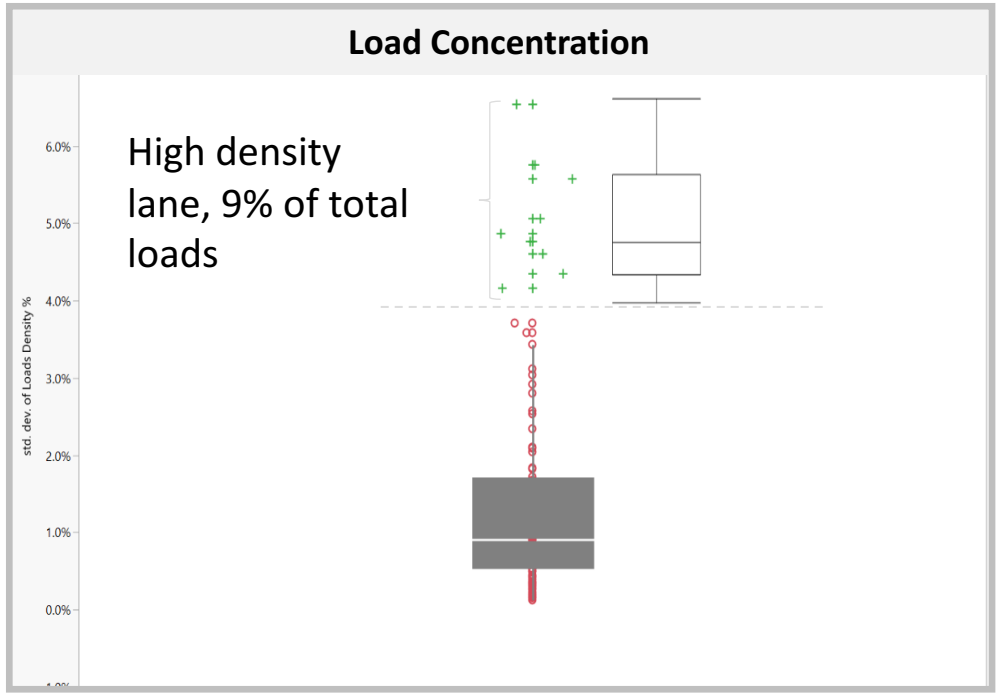


Null hypothesis is **rejected** for Major Players

Within the Major Players group there was a strong negative correlation between Std Deviation of Period Density and Perfect shipment.

The more inconsistent loads are across periods, the lower the perfect shipment rate is.

Clustering for Carrier Profiles



Only a small number of Carriers have lanes with high Load density (>3%). Those are about 9% of the total Loads in Major Player cluster.

2nd Hypothesis: A carrier will perform better in its high density lanes than low density lanes

Do carriers have high and low density lanes?

Clustering for Carrier Profiles

Shipper Performance	Perfect Shipment Rate	Lane Density
Cluster 1	49%	0.9%
Cluster 2	57%	0.2%
Cluster 3	82%	10%

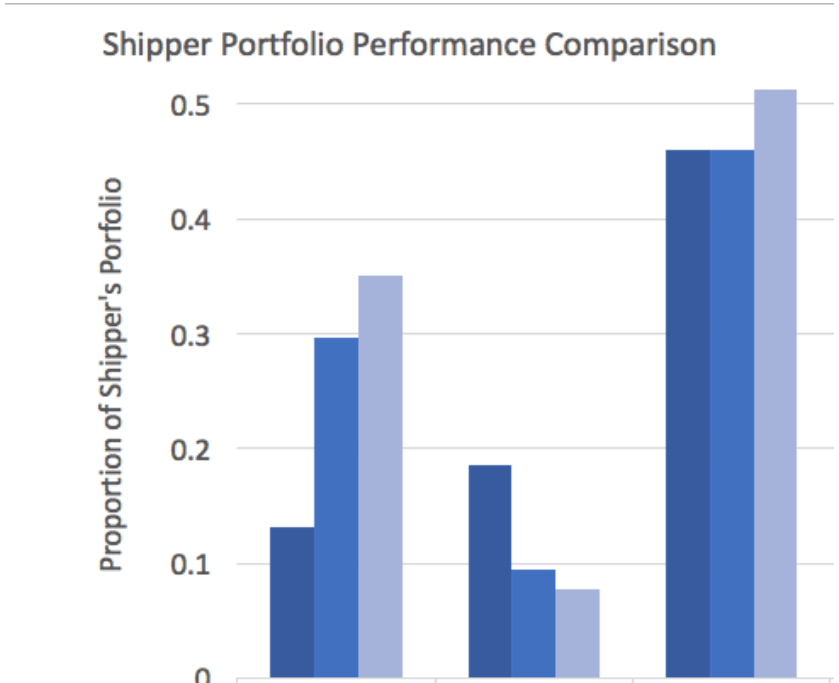
Null hypothesis is **rejected** for Major Players

Cluster 3:
1.8% of lane-carrier combination, lane density at 10% with 82% perfect shipment, outperform others with low density

6. Shipper Profiles

Analysis of shipper's portfolios of carriers viewed by carrier strategy and carrier asset base offered insights on strong-performing portfolio mixes to help inform future routing guide decisions.

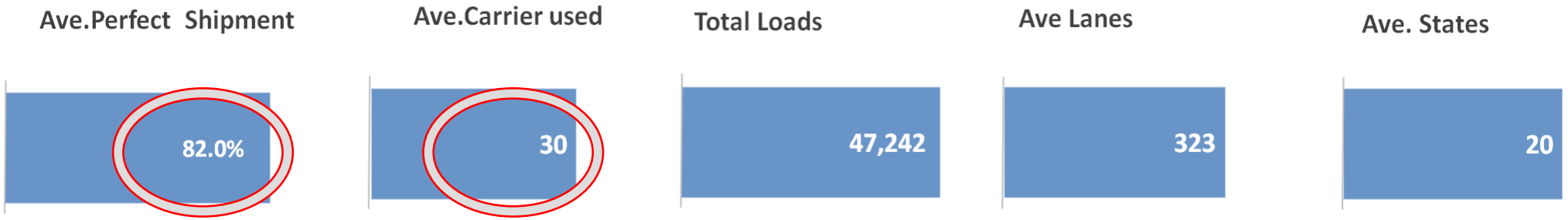
Shipper Performance Breakdown by Portfolio of Carrier Clusters

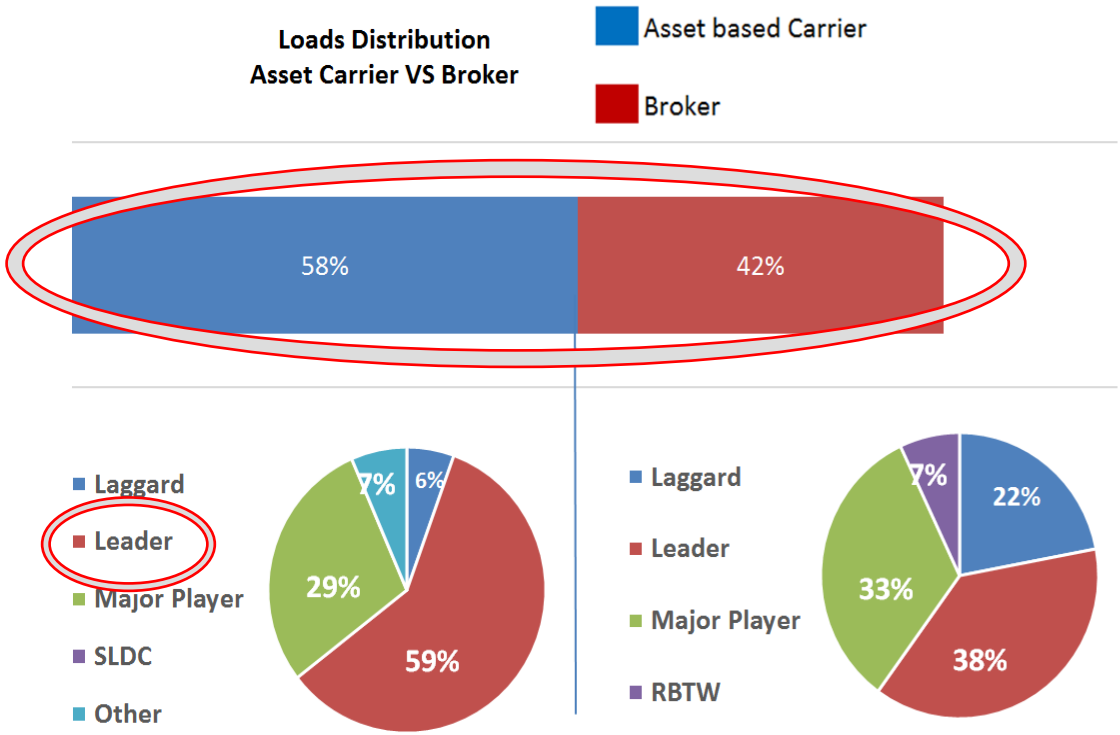


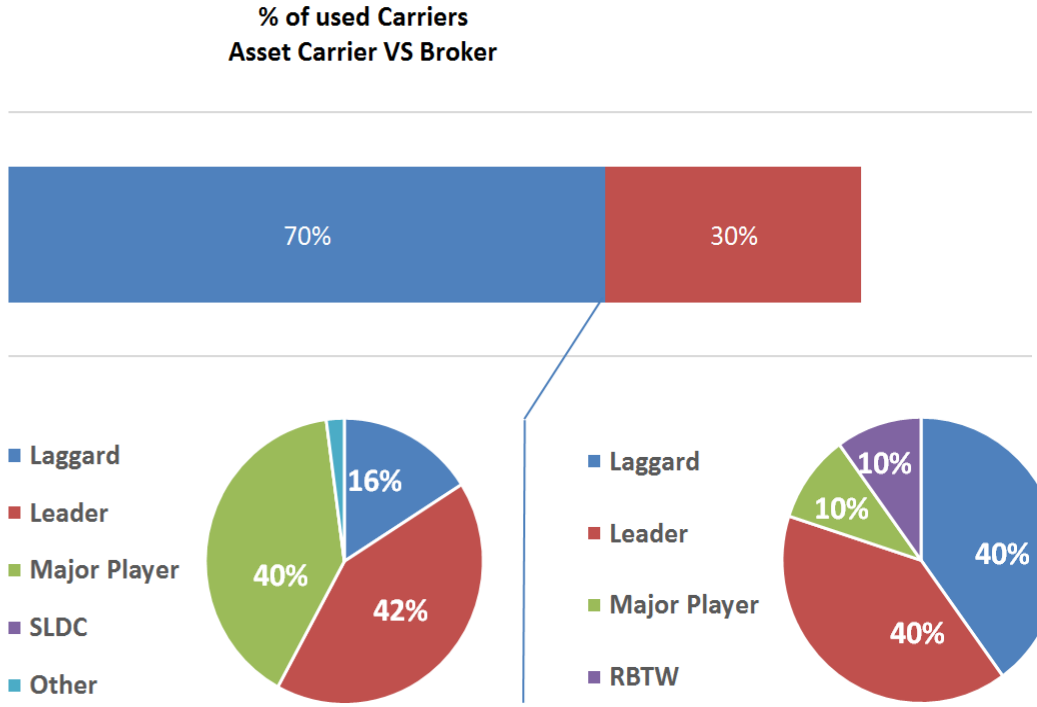
	Laggard	Leader	Major Player
Top 25%	13%	19%	46%
Middle 50%	30%	9%	46%
Bottom 25%	35%	8%	51%

Shipper Perspective- Carrier Deployment by Shippers

High Service Level Shippers

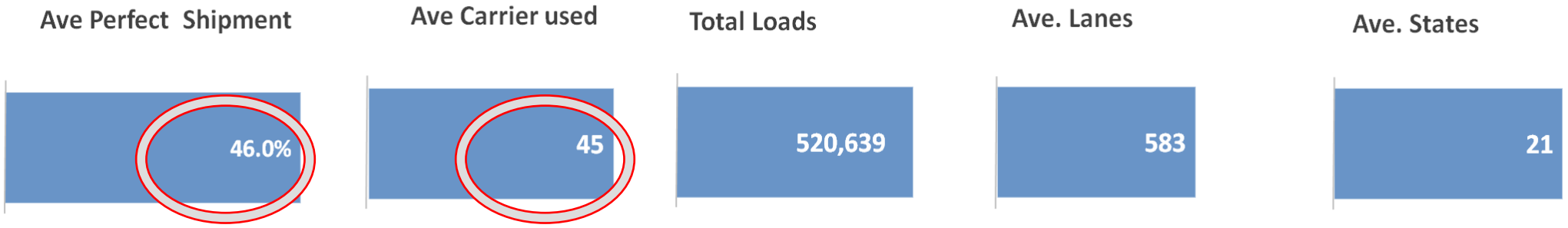


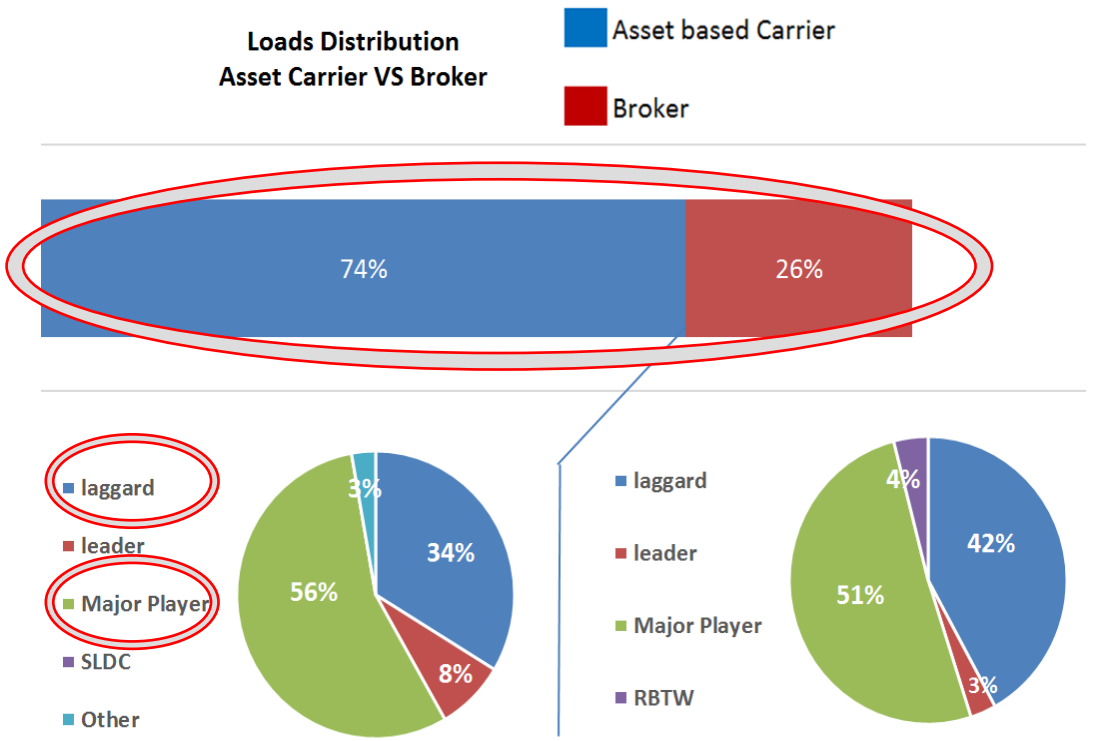


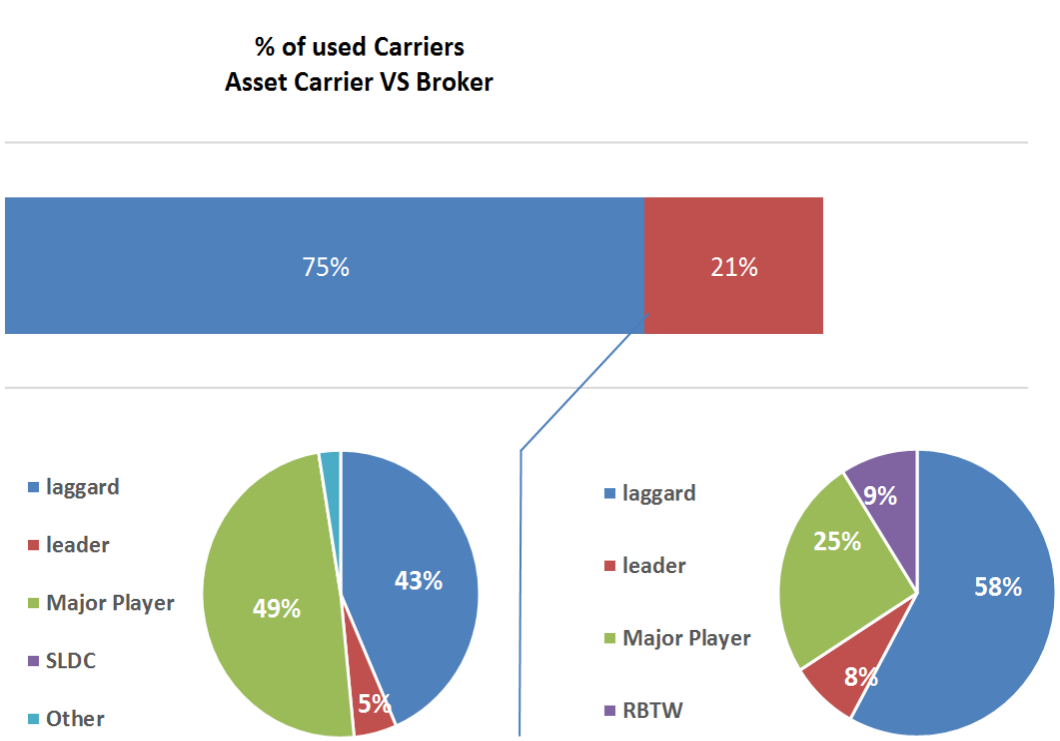


Shipper Perspective- Carrier Deployment by Shippers

Low Service Level Shippers







Shipper Perspective - Carrier Deployment Conclusion

Insight 1: Non-asset carriers can be the right strategic choice for a shipper

There is **no significant service performance difference** from solely favoring asset based carriers.

Shipper Performance	Perfect Shipment Rate	Proportion of Asset Based Carriers	Proportion of Non-Asset Based Carriers
High Performance Profile 1	82%	70%	30%
High Performance Profile 2	81%	33%	67%
Low Performance	46%	79%	21%

Shipper Perspective - Carrier Deployment Conclusion

Insight 2: Leader carriers improve shipper's overall service received.

High performing shippers use significantly **more focused carriers**.

Shipper Performance	Perfect Shipment Rate	Proportion of Leader Carriers (asset & non-asset)	Proportion of Loads by Leader Carriers (asset & non-asset)
High Performance Profile 1	82%	42%	51%
High Performance Profile 2	81%	51%	82%
Low Performance	46%	5%	7%

Shipper Perspective - Carrier Deployment Conclusion

Insight 3: Major carriers offer the most capacity to the market.

All shippers use Major Players to cover their loads but need to consider which Major Players are regional leaders.

Shipper Performance	Perfect Shipment Rate	Proportion of Major Player Carriers (asset & non-asset)	Proportion of Loads by Major Player Carriers (asset & non-asset)
High Performance Profile 1	82%	31%	31%
High Performance Profile 2	81%	44%	16%
Low Performance	46%	42%	6%

7. Implications

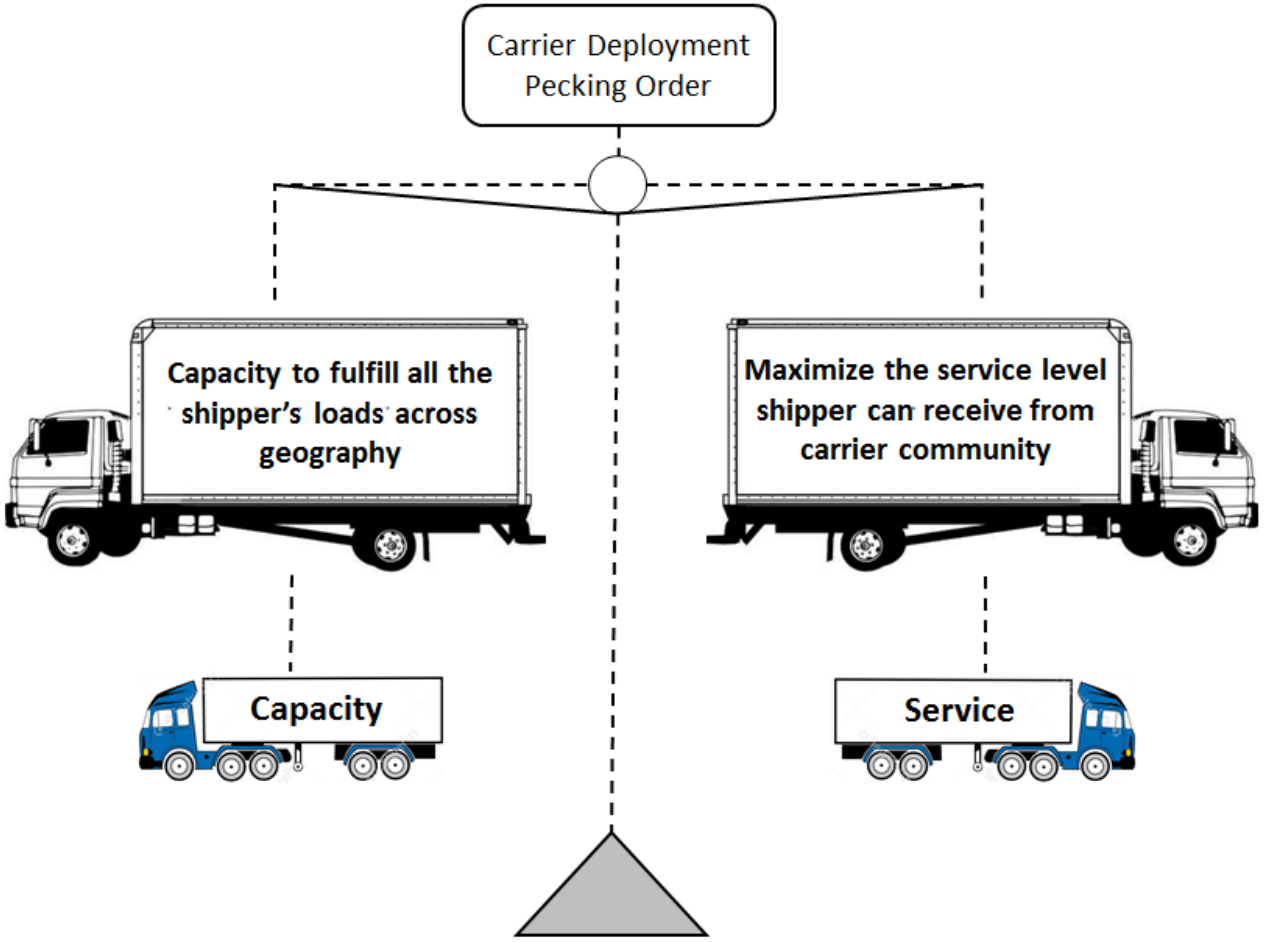
Differing carrier strategies and roles result in different service performance.

Some groups of attributes work together to improve freight performance. These include **longer lead times, consistency of load volume, geographic and lane focus, younger price ages,** and certain mixes of types of **both asset and non-asset carriers** within a shipper's portfolio.

Diversified shipper portfolios with a **higher proportion of more focused carriers** have stronger performance.

Implications for Carrier Procurement and Deployment

Balance Service Capacity and Service Level



The **Pecking Order** of carrier selection :

1. Identify Leader (more lane and customer focused) carriers in the lanes for which a shipper needs truckload service and maximize leader carrier's available capacity. **Develop relationships** to build this group.
2. Identify carriers in Major Players group, maximize their capacity in the lanes in which they are "**regional leaders**."
3. Complement the remaining loads using carriers in the Major Players group.

Broader Research Implications

Carriers are rated on a general scorecard which allows them to benchmark and gives shippers some guidance on developing their routing guides. However, we found clear distinctions in marketplace role and subsequent strategy for carriers, which had direct implications for their service performance. Suggests that the uniform scorecards used to evaluate shipper performance may not be the most appropriate way to rate carriers.

What does this mean?

Developing **strategy specific key performance metrics** and corresponding scorecards would give shippers a better understanding of carrier performance relative to their specific market needs.

This would also allow better visibility for shippers to **build strategic relationships** with the right carriers for them.

C.H. ROBINSON

Thank you!

This research would not have been possible without the generous time and help from…
Chris Caplice
Steve Raetz
Kevin Mccarthy
Glenn Koepke
Andrew Welch
Gaurav Karker

Questions?